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(54) Contact lenses with constant peripheral geometry

(57) The invention provides contact lenses. In particular, the invention relates to contact lenses in which the geometry of the lens periphery remains constant with changes in the optic zone curvature.

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Description

Field of the Invention

[0001] The invention relates to contact lenses. In particular, the invention relates to contact lenses in which the geometry of the lens periphery is constant.

Background of the Invention

[0002] The use of contact lenses for the correction of visual acuity is well known The front, or convex, surface of contact lens has an optic zone with a curvature for correction of the wearer's visual acuity. Thus, the optic zone curvature will change with changes in the wearer's prescription. This change in optic zone curvature is accompanied by changes in the lens mass and its distribution as well as the geometry of the lens area surrounding the optic zone, or the lens periphery.

[0003] The changes in optic zone and lens periphery geometry are problematic in that the changes result in variations in the fit of the lens and, thus, lens performance, as the wearer moves from one prescription to another. In the cases in which the lens prescription necessitates complex mechanical features, such as toric lenses or lenses with cylinder power, even greater variations in fit may be experienced as the lens prescription changes over time. Therefore, a need exists for a contact lens design that overcomes this disadvantage.

Detailed Description of the Invention and Preferred Embodiments

[0004] It is a discovery of the invention that contact lenses that have more consistent fit and performance as the wearer's prescription changes may be obtained by providing lenses with a constant peripheral geometry. By " constant peripheral geometry" is meant that, even with changes in the optic zone curvature, the peripheral zone geometry remains constant. For purposes of the invention, the peripheral zone of a lens is the area that surrounds the optic zone of a contact lens. The lenses of the invention exhibit predictability of performance and fit as compared to prior art lenses.

[0005] In one embodiment, the invention provides a method or manufacturing contact lenses comprising, consisting essentially of, and consisting of a.) providing a peripheral zone geometry for the contact lenses comprising, consisting essentially of, and consisting of a slab-off gap of about 4.50 mm, an edge thickness differential of about 0.170, a slab-off central diameter of about 8.00 mm or about 9.50 mm, and a bevel width of about 1.00 to about 1.50 mm; and b.) providing subsequently two or more optic zone designs for the contact lenses, wherein the peripheral zone design remains substantially constant.

[0006] In another embodiment, the invention provides a plus toric contact lens comprising, consisting essentially of, and consisting of a convex outer surface, a concave inner surface, the convex surfac having a slab-off gap of about 4.50 mm, an edge thickness differential of about 0.170, a slab-off central diameter of about 8.00 mm, and a bevel width of about 1.00 to about 1.50 mm.

[0007] In yet another embodiment, the invention provides a minus toric contact lens comprising, consisting essentially of, and consisting of a convex outer surface, a concave inner surface, the convex surface having a slab-off gap of about 4.50 mm, an edge thickness differential of about 0.170, a slab-off central diameter of about 9.50 mm, and a bevel width of about 1.00 to about 1.50 mm.

[0008] By "plus toric lens" is meant a contact lens with a toric, or cylinder correction, and a positive spherical power. By "minus toric lens" is meant a contact lens with cylinder correction and a negative spherical power. By "slab-off" is meant the tapered area of the lens peripheral to the central optic zone. By "slab-off gap" is meant the area of the lens that is located between the edges of the slab-offs. By edge thickness differential" is meant the difference between the thickest portion of the lens periphery in a non-slab-off area and the thinnest part of the periphery within the slab-off area. By "slab-off central diameter" is meant the vertical distance between the center points of the bottom edges of the slab-offs. By "bevel" is meant an inclined area at the periphery of the lens.

[0009] It is a discovery of the invention that, although changes in optic zone design, meaning curvature and/or diameter produce only small changes in contact lens mass volume, changes in lens peripheral zone design, made to accommodate the changes in optic zone curvature, may result in marked changes in peripheral volume. This volume change may make fitting of the lens more difficult as a wearer' prescription changes. Additionally, the volume changes may negatively effect performance of the lens for the wearer.

[0010] In the method of the invention, the peripheral zone geometry of the lens is designed first and does not vary as changes are made to optic zone design. Specifically, the peripheral zone geometry is designed so that the convex surface has a slab-off gap of about 4.50 mm, an edge thickness differential of about 0.170, a slab-off central diameter of about 8.00 mm or about 9.50 mm, and a bevel width of about 1.00 to about 1.50 mm. It is a discovery of the invention that the use of such peripheral zone design permits changes to be made to the optic zone curvature without changing the peripheral zone geometry. In this way, consistency in fit and performance of the lenses with changes in prescription is achieved.

[0011] After the design of the peripheral geometry for the lens is complete, the range of optic zone designs desired for the two or more contact lenses is provided by calculating the lens center thickness, optic zone curvature and diameter. The optic zone design may be carried out by any known method. Optionally, in addition to the optic zone and peripheral zone, a transition zone

may be provided, which zone may be useful to ensure that the optic zone intersection with the lens peripheral zone does not result in the formation of steps or ridges in the lens.

[0012] Contact lenses useful in the invention may be either hard or, preferably, soft lenses having cylinder correction, which lenses are made of any suitable material. Preferably, the soft contact lenses are made of hydrogel or silicone-containing hydrogel. Additionally, the lenses of the invention may have any of a variety of corrective optical characteristics incorporated onto the surfaces. For example, the lens may have any one or more of spheric, aspheric, bifocal, multifocal, toric or prismatic corrections. These corrections may be on either or both the convex or concave surface.

Claims

1. A method for manufacturing contact lenses comprising the steps of

   a.) providing a peripheral zone geometry for the contact lenses comprising a slab-off gap of about 4.50 mm, an edge thickness differential of about 0.170, a slab-off central diameter of about 8.00 mm or about 9.50 mm, and a bevel width of about 1.00 to about 1.50 mm; and
   b.) providing subsequently two or more optic zone designs for the contact lenses, wherein the peripheral zone design remains substantially constant.

2. The method of claim 1, wherein the slab-off central diameter is 8.00 mm.

3. The method of claim 1 wherein the slab-off central diameter is 9.50 mm.

4. A plus toric contact lens comprising a convex outs surface, a concave inner surface, the convex surface having a slab-off gap of about 4.50 mm, an edge thickness differential of about 0.170, a slab-off central diameter of about 8.00 mm, and a bevel width of about 1.00 to about 1.50 mm.

5. A minus toric contact lens comprising a convex outer surface, a concave inner surface, the convex surface having a slab-off gap of about 4.50 mm, an edge thickness differential of about 0.170, a slab-off central diameter of about 9.50 mm, and a bevel width of about 1.00 to about 1.50 mm.

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EUROPEAN SEARCH REPORT

Application Number
EP 99 31 0250

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 4 463 148 A (HOEFER PETER ET AL) 31 July 1984 (1984-07-31) * column 1, line 21 - column 3, line 56 *	1-5	G02C7/04
A	EP 0 571 320 A (CIBA GEIGY AG) 24 November 1993 (1993-11-24) * page 2, line 36 - page 3, line 26 *	1-5	
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

G02C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16 February 2000	CALLEWAERT, H

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 99 31 0250

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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